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Science and Technology Perspectives

DEVELOPMENTS

New Materials Center

(Japan) A "New Materials Center" was opened in September for quality-control evaluation of metal-based materials such as shape memory alloys, hydrogen storage alloys, amorphous alloys, superconductive materials, and fiber reinforced metals. Affiliated with the Osaka S&T Center, the new facility will receive funding in the form of donations and membership fees from steel, nonferrous metals, automobile, and machinery manufacturers. The facility furthers the Japanese metals research program inaugurated with the R&D Center for Metal-Based New Materials, opened in Tokyo last year. (KAGAKU KOGYO NIPPON 14 Aug 86; NIHON KOGYO SHIMBUN, 4 Sep 86)*

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FEATURE ARTICLES

REPORTS

PERSPECTIVES selections are based solely on foreign press, books and journals, or radio and television broadcasts. Some of the materials used in this publication will appear as abstracts or translations in FBIS serial reports. Comments and queries regarding this publication may be directed to the Center Chief, to individuals at the numbers listed with items, or to the Science and Technology Center at [redacted] STAT

DEVELOPMENTS

DEVELOPMENTS highlights worldwide S&T events reported in the foreign media. Items followed by an asterisk will be published by FBIS. The contributor's name and telephone number are provided.

Avionics

(Italy/PRC) Aeritalia will design and develop advanced electronic equipment to modernize Chinese A-5 jet fighters, according to an agreement reached between Aeritalia and the China National Aero-Technology Import and Export Corporation on 4 November. The first of the series of modernized fighters, designated A-5M, will be built by the Chinese Nanchang aircraft manufacturing company and will be flight tested in spring 1988. (Rome ANSA 5 Nov 86) STAT

Biotechnology

(France) The French National Advanced School for Chemical Industries has developed a special pharmaceutical manufacturing method involving separation by composite supercritical fluid chromatography. The School claims that enzyme-based pharmaceuticals can be easily obtained through this process. (Duesseldorf VDI NACHRICHTEN 24 Oct 86) Milan Unit STAT STAT

Commercial Satellite Launching

(FRG) After a formal study of the worldwide commercial satellite launching market, the DFVLR (FRG Research and Test Institute for Air and Space Flight) has concluded that, despite lower Ariane launch costs, the US will be the market leader by the end of the century. Its conclusion is based on the anticipated US development of innovative or upgraded propulsion systems. (Duesseldorf VDI NACHRICHTEN 26 Sep 86) STAT

Computers

(USSR/Poland) Computer-aided design (CAD) systems are being developed at the Minsk Production Association for Computer Technology to aid designers of computer components. The system selected for this project was the ESAPEVT Unified System of Computer-Aided Design for Computer Technology, a USSR-wide system, which provided more than 70 percent of the design documentation for the YeS-1061. (Moscow NARODNOYE KHOZYAYSTVO BELORUSSII No. 1, Jan 86) STAT

(USSR/Poland) An editorial workstation using a personal computer has been developed at the Laboratory for Experimental Information Service at the Novosibirsk Academy of Sciences. The workstation consists entirely of Soviet and CEMA components and is reportedly comparable to Western models. The equipment is currently being manufactured by the Polish MEAR-BLONE company. (SOVETSKAYA KULTURA 6 May 86) STAT

(Hungary) The new PTA, a portable computer, is being manufactured by the Communications Engineering cooperative under a license from Sharp. Capable of programming in both basic and machine code, the computer has a 20k-byte built-in RAM and a 16k-byte ROM capacity. It has CMOS circuits, a liquid crystal display, and a so-called "constant memory." (Budapest MAGYAR ELEKTRONIKA No. 4, 86)* STAT

(Hungary) At least half of all Hungarian-manufactured personal computers use the Z-80 microprocessor. In addition to its use in personal computers, the Z-80 is playing an increasing role in factory automation equipment. The Microelectronics Enterprise (MEV) is developing a CMOS cell matrix capable of about 800 dual-input NOR functions as a first step in fabricating a Z-80 circuit capable of asynchronous data transfer. (Budapest MAGYAR ELEKTRONIKA No. 4, 86)* STAT

ESPRIT Unix Project

(EC) The European Commission is preparing to suspend its antitrust regulations to further the ESPRIT Unix system. The X Open Group, established in August 1985 by Bull, ICL, Nixdorf, Siemens, Olivetti, Philips, Ericsson, Digital Equipment, and Sperry, would be authorized an exemption from the EC's normal competition regulations. The deadline for submission of arguments against the exemption was 7 November. The Commission considers the exemption justified in view of the anticipated technical and economic benefits of Unix. (Paris LA LETTRE DE L'INDUSTRIE INFORMATIQUE 15 Oct 86 from L2i01 Data Base)* Antwerp Unit STAT STAT

Factory Automation

(PRC) A large numerically controlled (NC) floor-type boring machine has been introduced in Wuhan. The result of a cooperative effort between West Germany and the Wuhan Heavy Machine Tool Factory, the Model FB260 boring machine meets advanced international standards and is claimed to be superior to similar models from other nations. It can be used for boring, milling, drilling, lathing, and threading. (Beijing RENMIN RIBAO 20 Aug 86) STAT

Laser Welding

(France) Sciaky, a major French manufacturer of welding equipment and a world leader in electron-beam technology, has installed at their plant an 8kW laser. The device is capable of welding 10-to-12-millimeter-thick stainless plates at speeds of up to 50 centimeters per minute and iron at speeds of 20 millimeters to 1.5 meters per minute. It will be used primarily as a research instrument to design more powerful welding equipment. (Brussels INDUSTRIE Nov 86)* Antwerp Unit STAT

1-Mbit DRAM

(FRG) Siemens has begun sending samples of its first 1-Mbit DRAMS to selected customers for evaluation. Using technology licensed from Toshiba, Siemens is producing the components using 1.2-micron CMOS technology on 150-millimeter wafers at its Regensburg factory. Siemens expects to begin series production next year and is designing a surface-mounted version of the chip. (Leinfelden-Echterdingen EEE 14 Oct 86) STAT

Magnetic Liquids

(USSR) The Laboratory of Hydraulics and Heat Engineering of the Belorussian Technological Institute imeni S. M. Kirov is conducting tests to determine practical applications for newly discovered "magnetic liquids." When added to turbine oil and exposed to a magnetic field, the liquid "bristles," displaying arrow-like spikes. Moreover, the liquid forms a permanent sheath in a metal tube. This magnetic "liquid shirt" has been used in pipelines to reduce friction, thereby doubling the throughput of crude oil. (Moscow SOTSIALISTICHESKAYA INDUSTRIYA 4 Oct 86)* STAT STAT

Microelectronics

(Hungary) The Microelectronics Enterprise (MEV) has developed the following custom-designed circuits: NMOS, CMOS (with Si gate), and bipolar networks with linear arrays. The company is also producing surface mounted components (such as the SOD-80, SOT-23, SOT-89, SOT-143, and SO-8) as well as small numbers of complex hybrid circuits. (Budapest MAGYAR ELEKTRONIKA No. 4, 86) STAT

Military Data Consolidation

(Japan) The Japanese Defense Agency will consolidate at a single facility the data information systems for the three branches of Japan's Self-Defense Force. Each branch currently manages its own system. The consolidation move is intended to facilitate exchange of information within the Japanese military. Scheduled to begin in 1987, the project will run for six years at a cost of 190 million yen. (Tokyo NIHON KEIZAI SHIMBUN 1 Nov 86)* STAT

Scanning Tunneling Microscope

(France) France's military research agency, the Directorate of Research and Technical Studies (DRET), has helped to fund the establishment of a scanning tunneling microscope laboratory at the Luminy faculty of the University of Marseilles. The pharmaceutical firm Roussel-Uclaf is discussing possible studies of red blood cells at the laboratory. France's second scanning tunneling microscope is in Paris and a third is being built in Lyons. (Paris LE MONDE 29 Oct 86) Antwerp Unit STAT

Sensors

(FRG) Dornier of the FRG, along with Selenia Spazio and Contraves Italiana of Italy, will develop a new image sensor system called the X-SAR. To be completed by 1990, the system will be used aboard aircraft and satellites to provide terrestrial imagery through heavy fog or haze. Future applications involve microwave communications and humidity measurements. (Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN 28 Oct 86) Milan Unit STAT

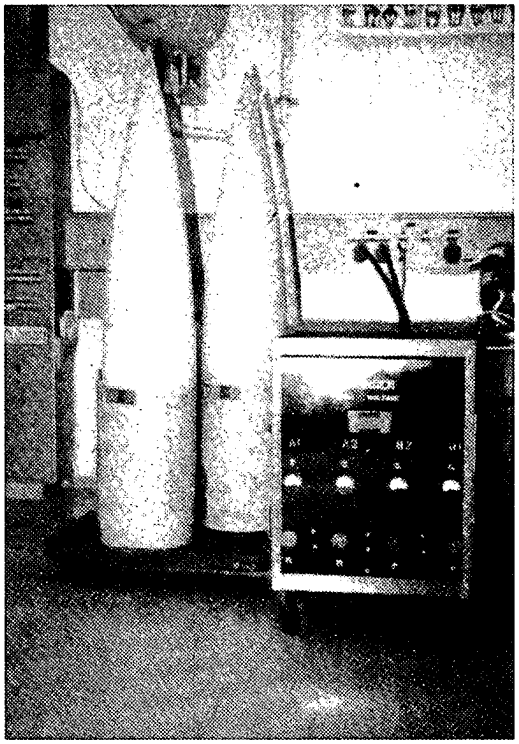
ISRAEL: "COOKING" I-HAWK MISSILES

Key Points: In 1983 the Israeli Air Force (IAF) solved the problem of SSLO (solid state local oscillator) frequency drift in the Improved Hawk (I-Hawk) missile by heating portions of the missile. An unexpected benefit of the process has been prolongation of the missile's service life.

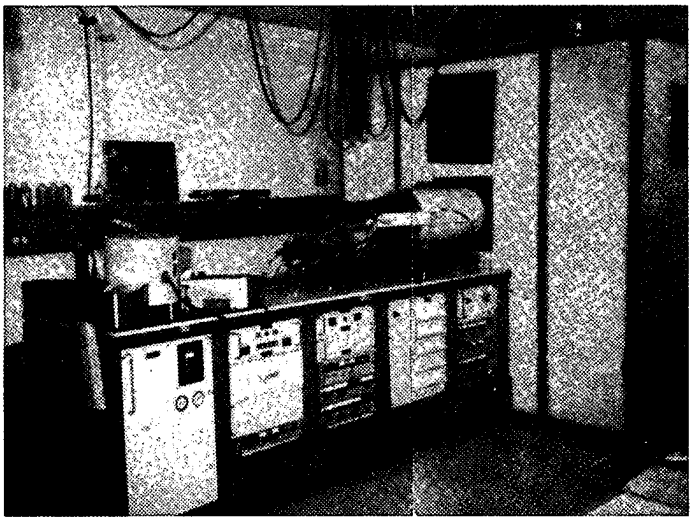
In late 1981, IAF anti-aircraft exercises revealed a malfunction in the I-Hawk missile. Tests showed the origin of the problem to be a drift in the SSLO frequency which prevented the missile from receiving command signals. According to the IAF monthly BITA'ON HEYL HA'AVIR of September, neither the manufacturer, Raytheon, nor the US Army could suggest a solution, and no other I-Hawk purchaser had discovered the problem. After a year of study, the IAF independently developed a procedure which corrected the malfunction and which is now used by Raytheon in producing new I-Hawk missiles.

Israeli experts concluded that the problem was caused by the overheating of the missile's SSLO. They calculated that the system could be stabilized by "cooking" portions of the missile at 72°C for 300 hours. The "cooking" is done by a heating device developed by the IAF and installed at its maintenance center. The procedure was effective not only in correcting the SSLO malfunction but in extending "sixteenfold" the service life of the deployed missile.

The use of this procedure, which can safely and inexpensively service eight missiles at a time, has been extended to Israel's entire missile inventory.



"Cooking" Apparatus at IAF Laboratory



"Cooking" Apparatus at IAF Laboratory

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USSR: CHEMICAL PRODUCTION

Key Points: Using low-tonnage chemistry, the Soviets plan to double production of high-purity compounds and triple that of biological reagents by the year 2000. Low-tonnage chemistry is integral to the production of hyperpure compounds essential to the thermonuclear energy, electronics, laser, and biotechnology industries.

The 12th Five-Year Plan emphasizes the need to boost the output and variety of Soviet low-tonnage chemicals. Two decades ago Soviet low-tonnage chemistry produced only 4,000 different chemical reagents and high-purity compounds with a total annual volume of 59,000 metric tons. Currently the USSR produces more than 12,000 high-purity compounds at an annual volume of 340,000 metric tons. These substances include ferrite powders, luminophores, single crystals and high-purity compounds for microelectronic and optical fiber manufacturers, and complexons and complexon-based compounds used in the biochemical and petroleum industries. The chemicals are manufactured at 30 plants operated by various ministries, with three-quarters of the total volume produced by facilities controlled by the Chemical Industry Ministry. Despite the increase in low-tonnage chemical production, Soviet producers have been unable to meet domestic demand, according to an interview with Deputy Minister of the Chemical Industry S.V. Golubkov in KHIMIYA I ZHIZN (No. 8, 1986).

The Soviet program to bolster production is scheduled to run through the year 2000. In the first stage, slated to end in 1990, the electronics, communications, and instrument- and machine-building industries will receive on a priority basis increased quantities of the compounds manufactured by the low-tonnage chemical industry. These compounds include high-purity hydrochloric, sulfuric, nitric, and phosphoric acids; pure-grade potassium and sodium hydroxides; and barium, copper, lead, and nickel salts. The second stage will address production in the less critical industrial sectors that require the products of low-tonnage chemistry. By the year 2000, the Soviets hope to double (over 1985 figures) their production of high-purity compounds, while production of biological reagents is expected to more than triple. In the area of biological reagents, techniques have been developed to produce aminoacid derivatives that have applications in human and animal medicine as well as in genetic engineering.

The Soviet chemical industry is focusing particular attention on the increased production of complexons, metal complexons, phosphorus and sulfur compounds, aromatic series derivatives, and polyaminopolyacetic acid ethers. The industry produces nearly 200 such compounds that are used as desorbents, etching agents, and modifiers for semiconductors as well as in microfertilizers and fodder additives. Moreover, Soviet chemists have synthesized macrocyclic complexons or crown ethers whose use in agriculture, energy production, and the petroleum industry will result in a savings of some 400 million rubles annually. (For a discussion of macrocycles, see SCIENCE AND TECHNOLOGY PERSPECTIVES Vol. 1, No. 9 p 13 and FB PN 86-128 of 23 Oct 86.)

Soviet planners admit that a flexible manufacturing system (FMS) is a prerequisite to boosting low-tonnage chemical output. In addition to long-term increases in production, the Soviets want a capability that allows rapid response (within weeks, if necessary) to research institute and industry demands for new compounds. Facilities participating in the low-tonnage chemistry program are the USSR Academy of Sciences' Institute of General and Inorganic Chemistry, the L.V. Bogatskiy Physico-Chemical Institute, the L.V. Pisarzhevskiy Institute of Physical Chemistry, the All-Union Scientific Research Institute of Chemical Reagents and High-Purity Substances (IREA), LuminophoreVNII, and the Yerevan Plant of Chemical Reagents.

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USSR: INSUFFICIENT PATENT PROTECTION

Key Points: Soviet patent protection of immobilized enzymes is very limited largely due to the lack of specific regulatory standards. Legal guidelines for obtaining and utilizing immobilized enzymes are limited to protecting methods of preparation and application rather than the actual enzyme, according to patent authorities and scientists writing in the KHIMIKO-FARMATSEVTICHESKIY ZHURNAL (July 1986).

The authors claim that research in the area of enzyme immobilization has decreased over the last decade because of the difficulty in obtaining patents on the enzymes. These enzymes are used in the direct transport of drugs to organ tissue, for external application in the treatment of cancer, and in clinical analysis. They are substances bound to a water-soluble polymer such as dextran or to a water-insoluble support substance such as alumina.

Certain advances claimed as inventions are simply optimization and refinement of established processes and, thus, are not deserving of patent protection. Moreover, the absence of Soviet legal norms reduces the opportunity to patent genuinely innovative breakthroughs in enzyme engineering and related fields. From an analysis of worldwide patent law governing the protection of immobilized enzymes, the authors argue that it is possible to protect these preparations as substances. They discuss criteria (novelty, positive effect, and essential differences) governing the protectability of an invention and offer guidelines for writing patent descriptions that will satisfy these criteria. Various examples of descriptions in Western patents for immobilized enzymes are presented. These descriptions frequently include the properties of the immobilized enzyme preparation, the method of immobilization, and the features of the starting materials (the enzyme to be immobilized and the support material). Characterization and identification of the immobilized enzyme obtained, including the bonds between enzyme and support, are especially important. The authors state that the basic difficulty in characterizing immobilized enzymes as objects of invention is the choice of essential features "each of which, taken separately, is necessary and all of which, taken together, are sufficient to distinguish the object of invention from all others and characterize it as to that property which will demonstrate a positive effect" (Paragraph 1.09 of the Instructions for State Scientific-Technical Examination of Inventions, EZ-2-74, 1983).

However, the authors believe that protection of immobilized enzymes is possible based on existing Soviet legal guidelines for "new substances" obtained by chemical or physicochemical means. A chemically obtained immobilized enzyme is formed by covalent bonding, whereas a physicochemically obtained immobilized enzyme is obtained by adsorption or other methods such as entrapment. The features which characterize chemical compounds, according to Paragraph 10.02 of the Instructions EZ-2-74, are the qualitative composition (which elements are present), the quantitative composition (the number of atoms of each element), the chemical bonds between atoms, and the relative position of the atoms to each other. An enzyme preparation obtained by covalent bonding of an enzyme to a support material can usually be characterized by the presence of defined chemical bonds. The structure of enzyme and support molecules and the type of bond formed between them are the most important features to be specified. For an enzyme immobilized by physicochemical means, the qualitative and quantitative composition of the preparation should be specified. No less important are other properties which characterize the new immobilized enzyme such as molecular weight, catalytic activity with respect to a defined substrate, stability as a function of pH and temperature, kinetic parameters, and stability during use and storage. For patent purposes, this information should differentiate a specific immobilized enzyme from analogous preparations.

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REPORTS

REPORTS surveys science and technology trends as detailed in articles, books, and journals. It also includes summaries and listings of articles and books which may serve as potential sources for future research. Conference proceedings will occasionally be presented in this section.
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USSR: FACTORY AUTOMATION

Soviet machine tool industry publications over the last three months have focused increasing attention on the need to accelerate factory automation. Industry publications exhort managers and workers to improve their performance through familiarization with flexible manufacturing systems (FMS) and numerically controlled (NC) equipment.

The journal VESTNIK MASHINOSTROYENIYA (No. 8) in August published an article urging standardization of FMS terminology as a crucial first step in effectively using this equipment. The journal notes that full utilization of FMS will result in improved productivity and a reversal in the trend toward reduced return on investments.

Increased centralization is also presented as a key feature of the modernization program. SOTSIALISTICHESKAYA INDUSTRIYA reported on 23 September that the newly created Leningrad Instrument Association imeni V.S. Voskov will "unify the efforts of specialists under a single enterprise framework." Moreover, the Voskov plant is producing electronic devices for controlling machining centers.

The Soviets, however, see themselves lacking the infrastructure required to automate rapidly. EKONOMICHESKAYA GAZETA in October observed that a chronic lack of coordination exists between production and delivery of raw materials. As a result, automated equipment remains underutilized. The paper cites a forge-and-press plant operating at one-sixth of capacity and, for lack of metal, forced to produce smaller bearings than those required by the customer.

The EKONOMICHESKAYA GAZETA article also satirizes efforts to reconcile automation technology with "conventional attitudes."

Рис. А. Пяткова.

"...And this is the inventor, together with his co-inventors, testing a new noise reduction device."

From EKONOMICHESKAYA GAZETA (No. 43, Oct 86):

Рис. А. Мелешина.

"Machines Must Shoulder Manual Labor."

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HUNGARY: IC PRODUCTION GAP

Six months after the devastating fire at the Microelectronics Enterprise (MEV), limited government funds and outmoded production technology continue to severely hamper Hungary's ability to revitalize its microelectronics industry. The government reportedly is without a viable strategy for coping with diminished chip production. (For previous reporting on the impact of the MEV fire, see SCIENCE AND TECHNOLOGY PERSPECTIVES Vol. 1, No. 4 pp 3-4.)

Although MEV was given priority by the government, limited funds restricted the enterprise's purchase of production equipment. Moreover, the government's mistaken belief that the Soviets would provide vital equipment for MEV's research laboratory prevented the enterprise from seeking alternate suppliers. Even with the equipment that survived the fire, MEV lacks the capacity "to operate pilot or small series production," the economic weekly HETIVILAGGAZDASAG reported on 11 October. (This assessment seems overly pessimistic. For examples of current MEV research and production, see the ***DEVELOPMENTS*** section of this issue.)

Hungary's only other large chip producing facility at the Central Physics Research Institute (KKFI) has been unable to close the production gap resulting from the MEV fire. Although the KKFI had volunteered to compensate for some of the production loss, lack of funds and obsolete production technology have stymied its efforts. The HETIVILAGGAZDASAG article attributes this failure to a previous Hungarian Government decision to concentrate chip production at MEV. As a result, the KKFI's production capability was allowed to lapse because of the government's inability to simultaneously fund MEV and the KKFI. According to Emil Kren, director of the KKFI's Microelectronics Institute, inadequate funding prevented the institute from purchasing advanced production technology. He commented that the institute has production equipment that is nearly 20 years old. The head of semiconductor research at KKFI noted that the institute was using 2-inch wafers and that MEV was using 3-inch wafers—sizes so outdated that these products have been discontinued and are being sold at half price.

KKFI's deputy director has claimed that for 5 percent of the cost of the equipment destroyed at MEV, his institute could have built a production line to alleviate the current chip shortage.

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FRG: BASIC RESEARCH SUBSIDIES

The FRG's Federal Ministry of Research and Technology (BMFT) research budget for 1987 and statements by Research Minister Heinz Riesenhuber reflect the continuation of a five-year trend toward increased government funding of basic research in innovative technologies (such as biotechnology and information technology) and the aerospace industry. The government has encouraged the private sector to assume a larger role in the funding of industrial research, according to the TECHNOLOGIE-NACHRICHTEN PROGRAM INFORMATIONEN of 5 September and the FRANKFURTER ALLGEMEINE ZEITUNG of 20 September.

The BMFT's increased funding of basic research will include larger subsidies for university research in biotechnology and information technology. Private research facilities such as the Max Planck Institute will also receive increased allocations. "Indirect measures" totaling DM214 billion in 1987 (up from DM20 million in 1982) will bolster leading-edge technology research at small- and medium-size companies through contracts, expanded research staffs, and joint research projects.

The 1987 BMFT budget allocates about 36 percent of its total DM56.1 billion to basic research, up from 26 percent of the DM43.4 billion budget in 1982. This increase reflects Riesenhuber's policy of "permanently guaranteeing" state financing for basic research. The BMFT has also boosted funding for the aerospace industry from DM696 million in 1982 to DM1.1 billion in 1987. A key element in its policy includes increased R&D funding for the Ariane 5 launcher and for the Columbus space module. The Ministry is also supporting the European Space Agency as a means of increasing European autonomy in the commercialization of space.

BMFT funding of industrial research, however, has decreased from 60 percent of the 1982 budget to a projected 43.3 percent of the 1987 budget. In addition to cutbacks in industrial research, the Ministry has reduced funding for other technologies (such as transportation and energy) in favor of increased support for basic research and aerospace R&D. Funds for nuclear energy research were the most severely reduced, declining from DM1.9 billion in 1982 to DM306 million in 1987. To compensate for this decline, the private sector has increased its industrial R&D expenditures from DM24.5 billion in 1982 to DM32.8 billion in 1987.

(For further details on the 1987 BMFT budget, see EUROPE REPORT: SCIENCE AND TECHNOLOGY, 10 Nov 86.)

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PREVIEWS

PREVIEWS is an annotated list of selected science and technology items being translated by FBIS. The list may also contain previously published items of wide consumer interest.

EUROPE REPORT: SCIENCE AND TECHNOLOGY

BMFT, VOLKSWAGEN FUND UNIVERSITY OPTOELECTRONICS LAB

Article details BMFT (Federal Ministry for Research and Technology), Volkswagen, and Baden Wuerttemberg regional government funding (DM21.1 million) for the establishment of a microstructures and optoelectronics research laboratory at Stuttgart University. The lab will focus on the development of new technologies for the production of micro-semiconductors. (Bonn TECHNOLOGIE NACHRICHTEN—MANAGEMENT INFORMATIONEN No. 441, 17 Oct 86)

BAYER RELEASES 1985 RESEARCH BUDGET STATISTICS

Examination of Bayer's 1985 investment (totaling DM2.1 million) in basic research, 40 percent of which was devoted to product development. Breakdown of Bayer research staff is also provided. (Bonn TECHNOLOGIE NACHRICHTEN—MANAGEMENT INFORMATIONEN No. 441, 17 Oct 86)

FRANCE SCHEDULES SPOT 3, 4 SATELLITE LAUNCHES

The follow-up satellites to the Spot-1 Earth observation satellite will be launched in 1988 and 1989. Article provides details on Spot 3 and 4 missions and notes that images will be stored in a data base called SPOT-IMAGE. (Bonn TECHNOLOGIE NACHRICHTEN—MANAGEMENT INFORMATIONEN No. 441, 17 Oct 86)

BMFT ESTABLISHES GUIDELINES FOR PROJECT CONTRACTORS

Article discusses BMFT guidelines governing its relationship with contractors in the areas of decision making, conflict of interest, and confidentiality. (Bonn TECHNOLOGIE NACHRICHTEN—MANAGEMENT INFORMATIONEN No. 441, 17 Oct 86)

ITALIAN S&T COMMITTEE RECOMMENDS BROAD RESEARCH REFORM

Milan Unit is translating a report by the Prime Minister's Committee on Science and Technology explaining the committee's three-point proposal to improve the quality and quantity of Italian research, increase research funding in the public and private sectors, and enhance incentives for industrial research and technology exchange. (Rome RAPPORTO AL PRESIDENTE DEL CONSIGLIO, 1986)

ITALIAN SPACE PLAN OUTLINES 1987-91 ACTIVITIES

The 75-page National Space Plan sets out Italy's aerospace goals over the next five years with particular emphasis on developing a capability to participate in international space projects. (Rome PIANO SPAZIALE NAZIONALE 1987-1991, 1986)

EC EXAMINES RESEARCH COMPETITION, COOPERATION

The EC has commissioned this 2-year study by the Max Planck Institute for Foreign and International Patents, Copyrights, and Competition Law on the possible need for restrictions on joint EC R&D programs to prevent the smothering of future European competitive opportunities. (Bonn TECHNOLOGIE NACHRICHTEN 28 Oct 86)

FRG INSTITUTES COOPERATE IN GENETIC ENGINEERING RESEARCH

The Technical University of Darmstadt and three private firms have joined efforts to develop genetic engineering techniques. Work on a new enzyme which inhibits lung cancer and inflammation is described. (Bonn TECHNOLOGIE NACHRICHTEN—MANAGEMENT INFORMATIONEN 28 Oct 86)

BMFT SUPPORTS THIN FILM TECHNOLOGY TRAINING

Funding for the Fraunhofer Society and two FRG universities to conduct training courses in the use of thick- and thin-film technologies for production processes is detailed. Article discusses the training, which is believed to include courses in surface mounting technology and the development of hybrid integrated circuits for sensor systems. (Bonn TECHNOLOGIE NACHRICHTEN—MANAGEMENT INFORMATIONEN 28 Oct 86)

EC MEMBERS DISAGREE OVER AIMS OF 1987-91 RESEARCH

Reports on West German, French, and British dissent to the proposed financing for the 1987-91 EC research program and on disagreements within the EC over implementation of the RACE, BRITE, and ESPRIT programs. (Bonn TECHNOLOGIE NACHRICHTEN—MANAGEMENT INFORMATIONEN 28 Oct 86)

AEROSPATIALE STRATEGY IN COOPERATIVE VENTURES

The article discusses reasons for and advantages of firm's international cooperative agreements. These include risk- and cost-sharing, competition with the US, and acquiring markets. Examples of Aerospatiale's international endeavors are cited. Some drawbacks are also discussed. (Paris LE NOUVEL ECONOMISTE 29 Aug 86)

DISCUSSION OF ESA HERMES, HOTOL, SAENGER PROJECTS

The article details the makeup and advantages of the French Hermes, the British Hotol, and the FRG's Saenger space transportation systems. (Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG 12 Jul 86)